GOES-16 EXIS XRS Level 1b (L1b) Data Release
Provisional Data Quality
August 15, 2018
Read-Me for Data Users

The GOES-R Peer Stakeholder Product Validation Review (PS-PVR) for EXIS XRS Level 1b (L1b) Provisional Maturity was held on July 18, 2018. As a result of this review and a subsequent addendum, the PS-PVR panel recommended that the EXIS XRS L1b data be promoted to Provisional Validation Maturity as of August 15, 2018.

The L1b data products derived from EXIS XRS are soft X-Ray fluxes derived from X-Ray Sensor (XRS) observations. The XRS X-ray fluxes cover two wavelength bands of 0.05-0.4 and 0.1-0.8 nm. The GOES-16 EXIS XRS L1b Provisional level data products are still undergoing calibrations and corrections. The product formats are defined in the GOES-R Product User Guide (PUG), but the PUG may not be fully up-to-date. Data released prior to the Provisional release date of August 15, 2018 contain significantly more issues, some of which are described in the GOES-16 EXIS L1b Beta Release notes. This earlier data should not be used.

Later this year, a corrected L1b GOES-16 data set will be released on the NCEI website (listed below) which will also be retrospectively corrected to early 2017 and will include the latest fixes. Additionally, L2 products such as averages and flare locations based on this scientific data set will be released at this site.

Provisional validation means:

- Validation activities are ongoing and the general research community is now encouraged to participate.
- Severe algorithm anomalies are identified and under analysis. Solutions to anomalies are in development and testing.
- Incremental product improvements may still be occurring.
- Product performance has been demonstrated through analysis of a small number of independent measurements obtained from GOES-15.
- Product analysis is sufficient to establish product performance relative to expectations (Performance Baseline).
- Documentation of product performance exists that includes recommended remediation strategies for all anomalies and weaknesses. Any algorithm changes associated with severe anomalies have been documented, implemented, and tested.
- Testing has been fully documented.
- Product is ready for operational use and for use in comprehensive cal/val activities and product optimization.
- Users of the GOES-16 XRS L1b data bear responsibility for inspecting the data and understanding the known caveats prior to use.

The following is the list of caveats for the GOES-16 XRS L1b data at Provisional-maturity status:

- The XRS fluxes will be noticeably contaminated by electrons during periods where X-ray fluxes are low and electron fluxes are high. This will be fixed in the L2 data. Until this is fixed, the low XRS fluxes should not be used for scientific analysis.
- The XRS primary channels (either A1 or A2 and either B1 or B2) are currently switched at fixed thresholds which potentially results in rapid switching between the primary channels. Current thresholds are: A1: 10^{-5} W/m^2, B1: 10^{-4} W/m^2. In the future, hysteresis will be added to the switching for the primary channels.
- XRS-A is larger by 34% on GOES-16 than on GOES-15; i.e. XRS-$A_{GOES-16}$ / XRS-A $_{GOES-15}$ = 1.34. GOES-16 XRS were carefully calibrated at NIST, while the fluxes from XRS on GOES-8 though -15 have all agreed with each other. The source of this discrepancy is unknown and is under investigation.
- The dark radiation coefficient is not being applied. This coefficient is used to correct the fluxes for proton contamination during SEP events. The result is that signals will be artificially high during SEP events, especially in the A2 and B2 channels. Analysis to determine this term is in progress.
- In the near future, the dark count determination for all channels, except XRS-B1, will be updated using values from periods of lowest electron fluxes. Impact will be to slightly increase fluxes, but this will only be noticeable for the lowest XRS-A fluxes.
- The start times in the file names and product_time variable are 1 second late. Use timestamps for times. These variables will be fixed.
- The roll angle in the the SUVI_CROTA variable is incorrect and should not be used. The variable will be renamed SPP_to_Sun_roll_angle and the value will be fixed.
- The yaw_flip_flag variable is not set properly and should not be used. This variable will be fixed. GOES-16 has had no yaw flips prior to the date of this document.
- Time stamps are center time. Metadata is currently missing a statement about this.
- There are small but routine data gaps. This is in analysis.
- Too few SPS angles are used in SPS angle averages. This variable will be fixed.
- The alg_container variable is not filled and should not be used.
- The lunar_transit_flag variable is not set. This variable will be fixed.

Persons desiring to use the GOES-16 XRS Provisional-maturity L1b products for any reason, including but not limited to scientific and technical investigations, should involve the responsible NOAA scientists before proceeding.

Contact for further information: OSPO User Services at SPSD.UserServices@noaa.gov

NCEI contacts for specific information on the XRS L1b data:
scientific issues: Janet Machol (janet.machol@noaa.gov)
data access issues: Margaret Tilton (margaret.tilton@noaa.gov)

NCEI website for GOES-R Space Weather data (will provide daily aggregations of XRS L1b data):
https://www.ngdc.noaa.gov/stp/satellite/goes-r.html